gular, with the angles rounded off, and having two sides somewhat larger than the third one; the angularity decreases progressively to the other end of the specimen, and at that portion but faint traces of it are observable; at this end of the bone the greatest diameter rather exceeds 10 lines. The thickest portion of the walls of the bone, which is at the curves supplying the place of the angles at the larger end, is $1\frac{3}{4}$ line, while the thinnest portion in the same plane is about the middle of the shortest side of the triangular section, and does not exceed $\frac{3}{4}$ of a line.

These structural proportions, in combination with the microscopical characters and the great density of the walls of the bone, leave no doubt of the character of the animal to which this specimen has formerly belonged; and from the marks of muscular attachment, the form and other peculiarities, my friend Professor Quekett, who has examined the bone, is of opinion that it has formed part of the proximal end of a tibia belonging to a bird little if at all inferior in size to an Emu. On comparing the fossil with the tibia of an adult Emu, the skeleton of which was about 6 feet high, I found that the latter was 16 inches in length; and on measuring the diameter of the parts of the recent bone corresponding with those of the fossil one, they appeared to be as nearly as possible identical; and the remains of the impression of the muscular attachment, and of the orifice for the admission of the blood-vessel into the shaft of the bone, which are situated in the recent one within the first 6 inches of its length from the proximal end, are in precisely the same relative position in both specimens.

There is every appearance therefore, as far as the mutilated condition of the fossil will allow us to judge, that it has formed part of an ancient Struthious bird as large as, and probably closely allied to, the Emu. The section of the bone represented in the woodcut is taken at the transverse fracture, about one-third of the length of the specimen from the larger end.

XXV.—*Notes on the Ornithology of Ceylon, collected during an eight years' residence in the Island.* By Edgar Leopold Layard, F.Z.S., C.M.E.S. &c.

[Concluded from p. 115.]

257. Numenius arquata, Linn. *Coudrey-malley-cotan,* Mal. *Whelp,* Dutch.

Common along all the flat sea borders in company with

258. Numenius Phæopus, Linn.

Neither of these species seem ever to be found in the interior.

259. Totanus fuscus, Linn.

260. Totanus ochropus, Linn.

261. Totanus calidris, Linn.

262. Totanus hypoleucos, Linn.

263. Totanus glottis, Linn.

264. Totanus stagnatilis, Bechst.

265. Actitis glareola, Gmel.

266. Tringa minuta, Leis.

267. Tringa subarquata, Gmel.

268. Tringa platyrhyncha, Gould, B. E. pl. 331. *Ola-watua*, Cing. *Cotan*, Tam.

These birds are generally distributed in all parts of the island where mud and water combine to offer them congenial homes. *Totanus hypoleucos* is found high up in the hilly country, frequenting the streams, walking upon the boulders which appear above the foaming torrents, in search of flies, or running on the sand in the shallow pools to feed upon the minute crustaceans which abound in such localities.

Tringa platyrhyncha is the rarest of the whole; one or two specimens were procured at Pt. Pedro, where also I procured a single pair of

269. Limosa ægocephala, Linn.

These I killed in the month of April in fine plumage.

270. Himantopus candidus, Bonn. *Poullow-kall*, Mal.; lit. "Long-legs."

Abundant in small flocks about the jungle tanks. They are by no means shy, but will suffer a near approach, and often alight on the same spot, though shot at several times; in flying they carry their long legs stretched out behind them, and utter a shrill cry of "wheet, wheet," which, when many join in chorus, is not an unmusical sound.

271. Recurvirostris avocetta, Linn.

A pair of these birds were shot by my esteemed friend D. Quinton, Esq., at Chundicolom near Jaffna, on the estuary.

272. Rhynchæa Bengalensis, Gmel. *Rajah-kas-watua,* Cing.; lit. King Snipe.

Not uncommon in all marshes; it is a bird of passage, arriving in October. Some few breed with us, the season of incubation being from May to July. The nest is a simple depression in the soil, and the eggs, four in number, are dark nankeen-yellow, profusely blotched with very large dark dry blood-coloured markings. Axis 1 inch 4 lines, diam. 1 inch.

273. Scolopax rusticola, Linn.

The Woodcock has been shot several times at Nuwera Elia, but has never fallen under the notice of either Dr. Kelaart or myself in its feathers. Dr. Kelaart says that he saw "a couple of birds called 'woodcocks' at a dinner table, which tasted uncommonly like the birds of that name." I heard that a specimen was preserved in the Military Medical Museum in Colombo in Dr. Kinnis' time, but, like many other specimens there, has been abstracted or suffered to fall into decay.

274. Gallinago stenura. *Kas-Matua,* Cing.

The common Indian Snipe is very abundant in all parts of Ceylon. They arrive in Jaffna about September.

275. Gallinago scolopacinus, Bon.

Not having met with this Snipe, I am obliged to quote Dr. Kelaart for its identity; he says, it "is found only in some of the highland districts. We have seen a few at Nuwera Elia*." I shot many snipes at Gillymalle which proved to be the preceding species, but I see no reason why the bird should not exist in the island, particularly as it is found in Calcutta: why, however, in this case should it be confined to the hills?

276. Gallinago gallinula, Linn.

In this instance I think the "sportsman's authority" may be trusted, as there is but little fear of the "Jack" being confounded with any of the Indian Snipes.

The late Mr. V. Burleigh of Jaffna, an ardent sportsman and beautiful bird-stuffer, told me that he used frequently to meet with them about Wally some years ago, but that of late he had not seen any. My own testimony only reaches to a bird I saw on table, luckily with both bill and legs perfect, and this I feel convinced in my own mind was a Jack Snipe.

* And yet he says at page 135 that he has only "*sportsmen's authority*" for this species. There are *very few sportsmen* that I ever found sufficiently discriminating to trust.

277. Hydrophasianus chirurgus, Scop. *Ballal-saaru,* Cing.; lit. Cat Teal (also *Juana,* Cing.), from their mewing cry.

Exceedingly abundant on all tanks, and not uncommon even on Colombo lake, frequenting the Lotus beds, walking on the broad leaves; they fly with great strength and facility, mounting to a considerable altitude.

278. Porzana fusca, Linn.

Syn. *Gallinula rubiginosa,* Temm.

Korawaka, Cing. The family name of all the tribe.

Rare: I have only seen three specimens, all found at Cotta near Colombo.

279. Porzana Ceylonica, Gmel. *Nordewind,* Dutch.

These birds arrive in the south of Ceylon in great numbers in the month of October and November, coming in with the first northerly wind which blows (whence the Dutch name). They drop exhausted, as if from a long flight, in the streets and houses, and conceal themselves till recovered from their fatigues. I found one in the well of my carriage, another in the folds of the gig apron, and a third in a shoe under my bed! The irides are a lovely yellow and carmine blended, the yellow forming a circle nearest the pupil. Some eggs were given me by a native as the eggs of this bird, which were precisely similar in all respects, save that of size, to those of the *Gallinula phœnicura.* Axis 13 lines, diam. 10 lines.

280. Porzana pygmæa, Nan.

Very rare: a single specimen was brought to me alive from Cotta.

281. Rallus striatus, Linn.

I received one specimen of this bird from Batticaloa, and another was brought alive to me while at Pt. Pedro. I placed it in my aviary, and it lived well on small sea-fish, soaked grain, &c.; it was unfortunately destroyed, along with many other favourites, by rats.

282. Rallus Indicus, Blyth, J. A. S. xviii.

Three or four of these Rails were shot in the Jayelle paddy fields near Colombo, by Lieut. Long of H.M. Ceylon Rifle Regiment, to whom I am indebted for these and several other interesting specimens.

283. Gallinula phœnicura, Pennant. *Korawaka,* Cing., from its cry, which this word precisely resembles.

Abundant throughout Ceylon in all marshy places, tanks, rivers, and even ditches. It constructs a nest similar in shape and position to that of our English Water-hen, and deposits from six to fourteen eggs of a pale fawn colour, thickly mottled with dark pinkish brown and bluish markings. Axis 1 in. 7 lines, diam. 1 in. 2 lines.

284. Gallinula chloropus, Linn.

Very rare: I only procured one specimen, that I shot in a marsh near Pt. Pedro.

285. Gallinula cristata, Lath. *Willi-kukula,* Cing.; lit. Marsh Fowl.

Common in the south about Matura, frequenting the sedges, and feeding mornings and evenings on the inundated grassy lands or paddy fields. It is very rare northward, only one specimen falling under my notice: I shot it in the same locality as the preceding.

286. Porphyrio poliocephalus, Lath. *Kittala,* Cing.

Abundant in secluded marshes. It is a shy wary bird, difficult to flush (unless the shooter comes suddenly upon it), preferring to skulk amongst the reeds, over and between which it runs with great facility and swiftness. Its nest is constructed like that of *Gal. phœnicura*; the eggs a yellowish buff colour, sparingly marked with smallish purple, faint blue, and olive-green spots.

287. Phœnicopterus roseus, Pallas. *Inglis Koku,* Tam.; lit. English Heron; the birds when standing in lines, feeding, resembling with their red wings and white bodies an English regiment in full parade dress. *Krop-gans,* Dutch.

Migratory, appearing in the north in November; they are so plentiful on the salt-lakes and estuaries of the northern and eastern provinces that I have seen the shores for miles white with them, and when the assembled multitudes rose on the wing, it was with a noise that drowned the roar of the surf which thundered on the beach close by. They are said to breed near Hambantotte.

288. Sarkidiornis melanonotus, Pennant.

Not uncommon on the larger tanks in the Wanny; it keeps together in flocks, and I fancy breeds with us.

289. Nettapus Coromandelianus, Gmel. *Mal-saaru,* Cing.; lit. Flower Teal, from its beauty. *Rajah-tara,* Mal.; lit. King Duck.

Common on many of the tanks in the Wanny, particularly in the neighbourhood of Anarajahpoora, where also

290. Anas pœcilorhyncha, Pennant,

is frequently met with, though it is one of our rarest ducks.

291. Dendrocygna arcuata, Cuvier. *Chemba-tara,* Mal.; lit. Red Teal; and *Tatta-saaru,* Cing. *Tree Duck* and *Whistling Teal* of European sportsmen.

Common on all fresh water throughout Ceylon, but never found on the sea. They breed with us in the month of June.

292. Dafila acuta, Linn.

The "*Pin-tail*" is occasionally shot on the Jaffna estuary by the native duck-shooters and brought into the bazaar for sale, fetching about 3*d.* each.

293. Querquedula crecca, Linn.

and

294. Querquedula circia, Linn.

During the months of November, December, and January, the head of the Jaffna estuary, and all the low grounds just within the sea-bank (which is usually broken through at this season), are covered with vast flocks of these birds, which are killed so plentifully by the natives with their miserable guns and worse powder, that they are sold in the bazaars as low as one halfpenny each. The method adopted by the native hunter is to train one of the plough buffaloes for the sport; it is guided by means of a couple of ropes attached to its horns, a slight pull at which turns the animal right or left, thus enabling the shooter to keep on the off-side till within shot, when he rests his rusty musket on the brute's shoulder and fires. A punt and gun on these waters would do wonders, and I conceive amply repay an ardent sportsman the trouble and expense of reaching the spot.

295. Fuligula rufina? Pallas?

I introduce this species with a mark of doubt, because I only know them through my telescope. I saw two or three pairs for several weeks on a piece of brackish water between Jaffna and Chavagacherry; they would not allow me to get within 250 or 300 yards of them, and I therefore never managed to shoot one.

A head of *F. rufina*, however, which I received from Calcutta was identified by a native as of a bird he knew and had killed on that very piece of water, though he had not seen them elsewhere.

296. Spatula clypeata, Linn.

Passing over the bridge crossing an arm of the above-named lake, I surprised a female of this bird with her brood of twelve young ones, most of which I captured; the mother, though shot at before I knew of the little ones, kept flying round me and often dropping into the water and feigning lameness, to draw me away from her offspring: this occurred in the early part of March. I have bought old birds from the shooters in November.

297. Podiceps Philippensis, Gmel. *Mukelepan*, Tam.; lit. Diver.

Common on large tanks and even in Colombo lake.

298. Larus brunnicephalus, Jerd. *Pullu*, Tam.; lit. Wormer. Family name for Gulls and Terns.

Common all round the coast and on the lakes and estuaries; it swims well and catches small fish.

299. Larus ichthyaëtus, Pallas.

I saw two specimens of this fine and unmistakeable Gull on the 11th of November 1851, at Pt. Pedro, after a severe storm; they were leisurely wending their way along the edge of the coral reefs northward, and I watched them with the glass for five minutes or more.

300. Dromas ardeola, Payk.

I place this bird here among the Terns, as I cannot help agreeing with Mr. Blyth in his remarks upon its affinities and position. I have obtained several specimens, all at sea, with one exception, which was on Calpentyn lake or estuary. A description of the egg which I formerly sent to Mr. Blyth, and his observation on the species, will be found in 'Contributions to Ornithology,' published by Sir William Jardine.

301. Sylochelidon Caspius, Lath.

302. Gelochelidon Anglicus, Mont.

303. Hydrochelidon Indicus, Stephens.

304. Thalasseus cristatus, Stephens.

305. Thalasseus Bengalensis, Lesson.

306. Seena aurantia, Gray.

307. Sterna Javanica, Horsf.

308. Sternula minuta, Linn.

309. Onychoprion anasthætus, Scop.

The nine species here enumerated are found pretty generally along our sea-border and on the lakes, estuaries, and salt leeways. I could on any evening shoot six or eight specimens of *Sy. Caspius*, either off Wally or Puthencally Bridges, as they flew *outwards* to sea, and the same in the morning as they returned *inland*. *G. Anglicus* and *H. Indica* are common all round the island. Of *Th. cristatus* I obtained one specimen at Pt. Pedro. *Th. Bengalensis* and *S. aurantia* pass in vast flights westward along the coral-reefs on the north of Ceylon during the months of May and June. *St. Javanica* is common even on the lakes at Anarajahpoora, where also *St. minuta* is often seen, though the latter is most common on tanks and still waters near the seashore; these two species hunt much over dry paddy fields, picking up insects of all kinds, small crabs, &c. *Ony. anasthætus* is very rare; I obtained three specimens about ten miles out at sea, off Pt. Pedro, when on a dredging excursion.

310. Atagen ariel.

Mr. Brodie of the Ceylon Civil Service first shot this species on Calpentyn lake, and I subsequently saw two, which were killed from the Light-house in Colombo in February 1853; one passed into my possession, the other into the Museum of the Ceylon Branch of the Royal Asiatic Society. I frequently saw them during the month flying at immense altitudes over the coast.

311. Plotus melanogaster, Gmel. *Beli Kawa*, Cing.

Common on all good-sized tanks: breeds at the Tangalle lake.

312. Pelecanus Philippensis, Gmel. *Koolookedai*, Mal.

Not unfrequently met with in small flocks on the sea-coast upon estuaries and still water. I am told they breed near Mulletivoe, which is a splendid locality for all these tribes.

313. Graculus Sinensis, Shaw.

I have seen a few of these birds on the fishing kraals in the Jaffna estuary, in company with the much commoner

314. Graculus pygmæus, Pallas. *Cadel cagam,* Mal.; lit. Sea Crow. *Dia Kawa,* Cing.; lit. Water Kawa. *See Krai,* Dutch. *Graya de Mare,* Port.

—which is also found abundantly on all the inland lakes and rivers of any magnitude.

315. Thalassidroma pelagica, Briss.

The Stormy Petrel is occasionally seen flitting about Colombo roadstead and Galle harbour, particularly after rough weather. It was the last bird that I saw when I quitted the shores of the island, and the last of my "Notes on the Ornithology of Ceylon."

XXVI.—*On the Fertilization of Ferns.* By W. Hofmeister *.

[The author having kindly sent me a copy of the following note, I place it before the readers of the 'Annals' as an important supplement to the notices I have published on the subject in this Journal † and elsewhere. It may be remarked that these statements, recording direct observation of the passage of the spermatozoids down the archegonium, take away the necessity of attributing a conducting power to the mucilaginous contents of the canal of the archegonium, which I speculatively suggested, never having been able to find a spermatozoid in contact with the germinal vesicle.—A. H.]

Numerous examinations of the prothallia of various Ferns in which the embryo was in course of development—examinations made for the purpose of ascertaining the order of formation of the cells of the vegetative organs—have led to my discovery of certain circumstances, hitherto unknown, affording more direct conclusions regarding the process of reproduction in the higher Cryptogamia.

The germinal vesicle originates in the central cell of the archegonium, around a nucleus which appears in the vaulted apex of that cell, without the primitive central nucleus undergoing any essential change. I have already observed and described this phænomenon in the Equisetaceæ (Abhandl. der kön. Sächs. Gesellsch. der Wiss. ii. 172); it holds good of all the vascular Cryptogamia. Before fertilization the germinal vesicle fills scarcely one-third of the central cell. The primary nucleus of

* From the Reports of the Royal Society of Sciences of Saxony, April 22, 1854. Communicated by Arthur Henfrey, F.R.S. &c.

† Ann. Nat. Hist. 2nd Ser. vol. ix. p. 444. Linnæan Transactions, vol. xxi. p. 117.